Claims

We claim:

1. A method for determining a gradient magnitude image from a range image, the range image including a plurality of intensity values at pixel locations, comprising:

determining, for each pixel (i,j), a horizontal central difference *dx*, and a vertical central difference *dy*; and

setting a 2D gradient magnitude at each pixel (i,j) in a gradient magnitude image I_{GM} to 0.5 * sqrt($dx^2 + dy^2 + 4$).

2. The method of claim 1 further comprising:

scaling the range image to produce a scaled range image where a unit intensity value at each pixel corresponds to a unit distance value.

3. The method of claim 2 further comprising:

selecting a 3D point **p**; and

determining a magnitude of a gradient at point **p** from the scaled range image and the gradient magnitude image I_{GM} comprising:

perpendicularly projecting point **p** onto the scaled range image to determine a location (x,y);

interpolating a gradient magnitude at the location (x,y) from the corresponding 2D gradient magnitude image values near the location (x,y); and

setting the magnitude of the gradient at point **p** to the interpolated gradient magnitude at location (x,y).

4. The method of claim 2 for determining a corrected projected distance at a 3D point **p** further comprising:

determining a projected distance at point **p** from the scaled range image;

determining a magnitude of a gradient at **p** from the scaled range image and the gradient magnitude image I_{GM} comprising:

perpendicularly projecting point **p** onto the scaled range image to determine a location (x,y);

interpolating a gradient magnitude at the location (x,y) from the corresponding 2D gradient magnitude image values near the location (x,y); and

setting the magnitude of the gradient at the point **p** to the interpolated gradient magnitude at the location (x,y); and

setting the corrected projected distance at point **p** to the projected distance at point **p** divided by the magnitude of the gradient at point **p**.